

What feature in the embankment reduces the power of waves

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# 1. Motive

Video of tsunami hitting the embankment

➡ We would like to research the **relationship between waves and embankments.**

# 1, Materials

box ×2

slatted drainboard

(46.5×85)

stick ×2

cray (bank, house)



## 3,Method

- A container is placed on the edge of a  $45^\circ$  slope, level with the ground, and water is poured into the container by releasing it with the hand.
- A model of a house was placed behind the bank of various shapes at the point where the water flowed into the container.
- The distance the house flowed was converted into damage as the result of the experiment.



45°

bank

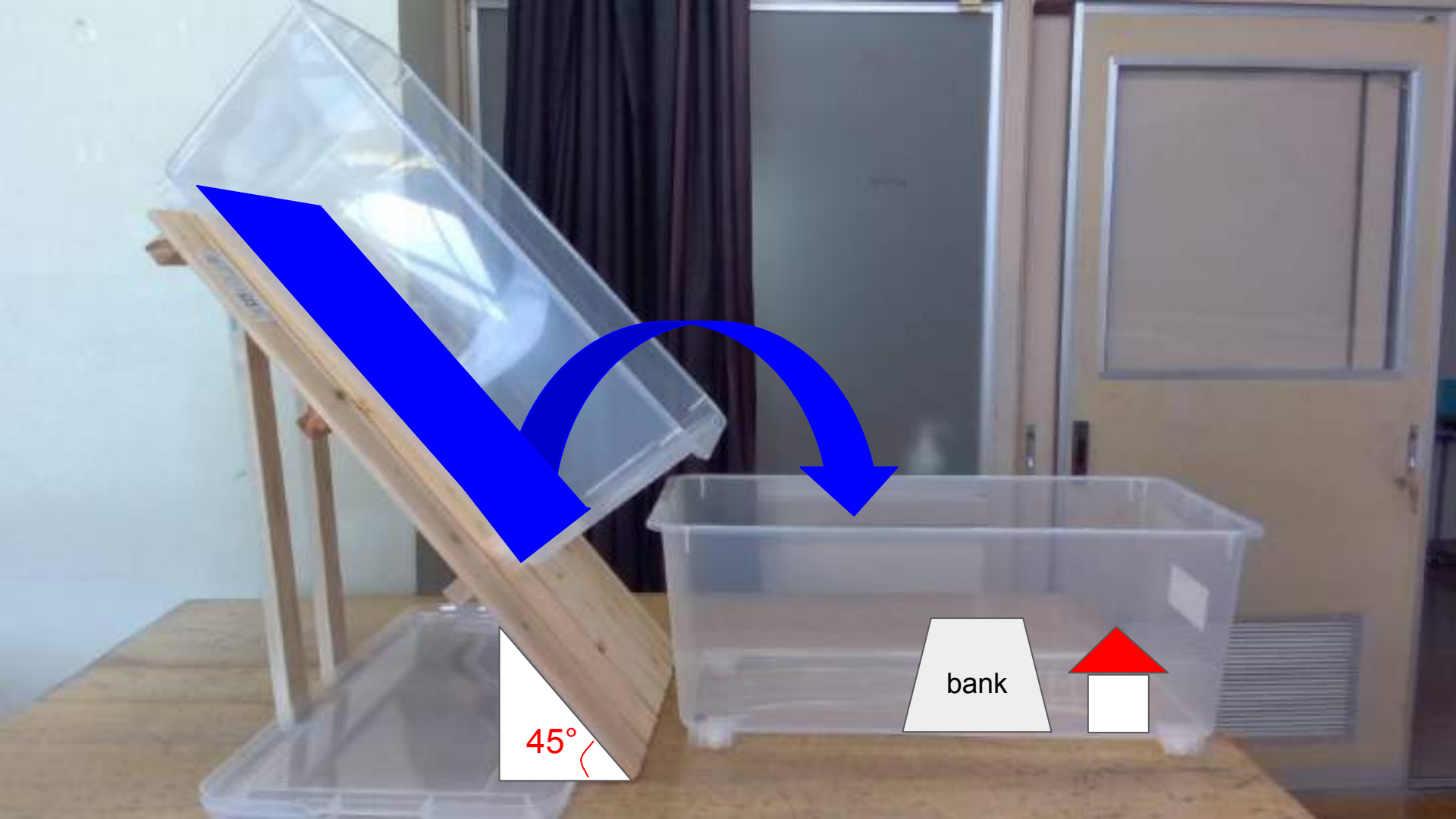




45°

bank





45°

bank



## Downside

**First stage of testing:** large error margin

**Solution:** Increase the number of trials and take a comprehensive look to find out how much each embankment can reduce the power.

## 4, Shape of the banks and each hypothesis



using as a reference for  
comparison

Based on the results obtained with  
this bank, investigate how the  
following three types of banks work



# 〈Embankment with return〉



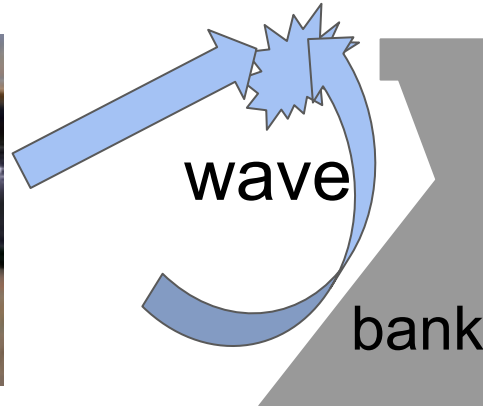
surface



side



above



launching the water in the  
return area upwards

Prediction

reduce the power of the  
water(including the water  
that go over the bank)

# 〈Embankment with convexity〉



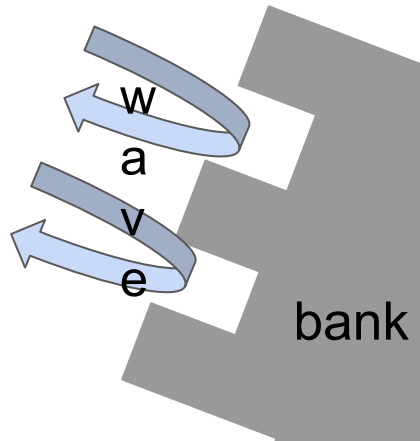
surface



side



above



Prediction

crashing wave will be stirred, and it will weaken the power.

# 〈Embankment with disks〉



surface



side



above

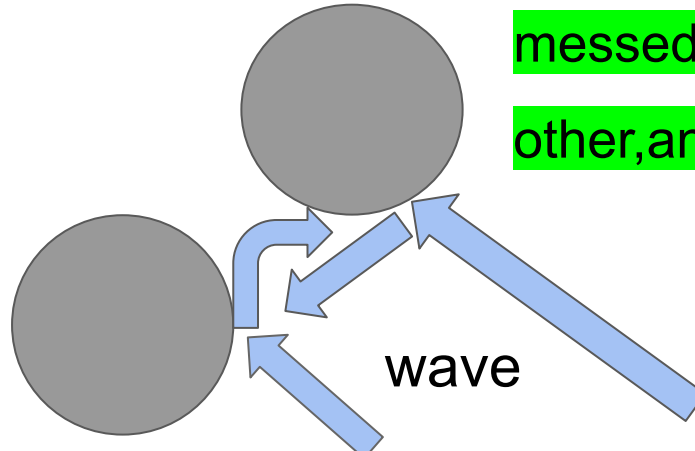
put disk-shaped stuffs on surface

Prediction

according to the convex part,

messed wave collide each

other, and kill the power.



## 5.Changes

- no enough space for the house model.

➔the movement of the water after the impact was sufficient to judge how much the bank reduced the force of the impact

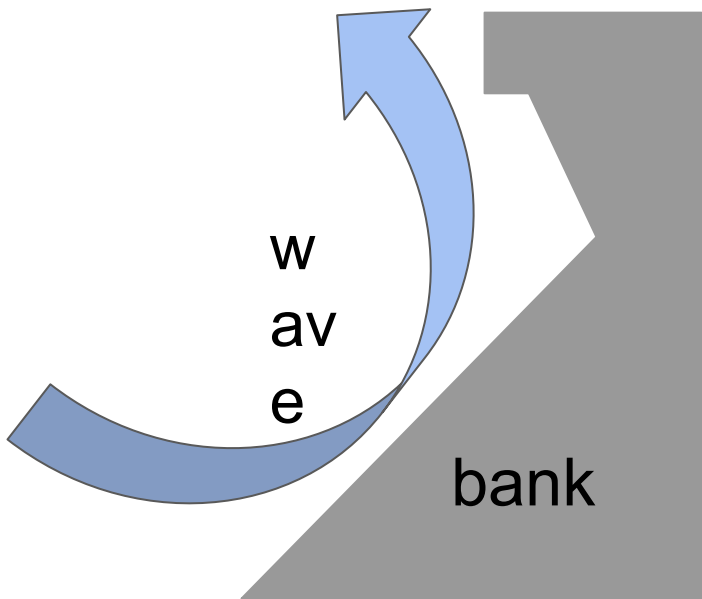
➔not to use it.

embankment with disks was not used

- ▶it was damaged and could no longer be used.



result①



## embankment with return

The water was visibly launched in the return area.

The waves were reduced **the most** among the three banks.

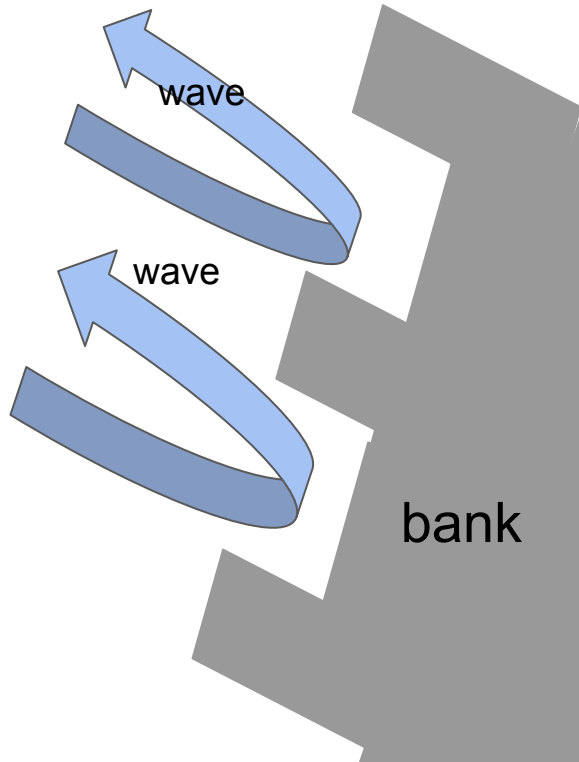




## Consideration 1)

The fact that the water was being launched suggests that the projection was to "launch the water and reduce its power, including the surrounding water that was about to go over the embankment" as predicted.

## Result 2)



## bank with convexity

The fact that the concave areas were filled with water shows that **some of the water was trapped in the concave areas.**

It did not appear to be launching water.

## Consideration 2)

Water enters the concave area, which reduces momentum compared to normal

Water bouncing back in the concave area collides with the next wave, canceling it out and reducing its momentum.

# Conclusion

Both the convex and returned banks have a similar top end.

Except at the top end

convex→Uneven surface makes it difficult to work the top edge device.

return→Because there is no device other than the top end,

The top end device works well

## 7, Reflection

- a long time to determine the method
- could not create waves exactly
- could not obtain good pictures of the waves
- manually operated → not accurately
- no enough types of banks